

Case report

Retained intra cranial blade – medicolegal perspectives

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Abstract

A fatal case of a homicidal penetrating head injury by retained blade of knife is reported. The blade of knife penetrated the skull bone after breaking from a knife handle and remained lodged in the intracranial cavity for 5 days resulting in death from intracranial bleeding and brain oedema. The need of proper and complete examination of the head injury and its medico-legal importance is emphasized. © 2005 Elsevier Ltd and AFP. All rights reserved.

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1. Introduction

It has been truly said that no injury of the head is too trivial to be ignored or so serious to be despaired of. Head injuries are common and account for about one fourth of all deaths as a result of violence.¹

Trauma as a general rule carries medico-legal implications; head injury adds complexity to the problem, for the reason that the full effects of trauma cannot be completely evaluated until some time has elapsed after the alleged injury. Tedeschi further states that any scalp lesion, even if minor, may constitute important medico-legal evidence. Careful exposure and examination of cranium may confirm the impression received from a wound in the scalp.²

This paper reports a case in which a man was stabbed on the head by knife. The blade from the handle of knife broke and penetrated the cranial cavity and remained embedded in the frontal lobe of brain. This resulted in intra-cranial bleeding and brain oedema, as a consequence of which the victim died. A question may arise during the trial whether deceased was the victim of murder or negligent conduct of a duty doctor in Casualty Department of district hospital.

2. Case report

A 21 year-old man was involved in an altercation which resulted in incised penetrating wound of head. At arrival in the casualty department of a district hospital, the patient complained of knife stab wound, headache to the medical officer on duty and he was fully conscious. The casualty doctor sutured the wound on frontal area of head, prescribed paracetamol and brufen and advised the patient to return after a week for removal of stitches. No radiographic assessment of patient was undertaken. The patient was not admitted into the ward for observation. The patient went home and 5 days later died at home. According to his family members, he had been complaining of headache since assault and started developing decreasing level of consciousness since the assault and developed unconsciousness after 4 days.

A medicolegal autopsy was performed a day after his death.

3. Post mortem findings

External examination revealed a 2 cm sutured wound on the left side of mid of frontal area, 8.7 cm above the left eye brow. Removal of sutures revealed an incised penetrating wound of scalp.

Once the scalp was retracted a metallic object was seen penetrating into cranial cavity through outer table

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of frontal bone on right side, adjacent to mid line (Fig. 1). Upon further dissection and exposure of skull, a defect (3 cm) was observed in right frontal bone, just adjacent to mid line. Left margin of defect in frontal bone was undermined and right margin was overhanging. There were fragments of frontal bone driven into cranial cavity, with a cut (2 cm long) in underlying dura and right frontal lobe was penetrated (cut 2, depth of 4 cm, Fig. 2). Right frontal lobe of brain contained

intracerebral clot (about 30 ml) with subarachnoid haemorrhage over the right frontal parietal lobes of brain and subdural haemorrhage over the right cerebral hemisphere (Fig. 3). Brain was oedematous and shifted to left side with bilateral Uncus grooving with haemorrhages. A firmly lodged/embedded blade of knife (7.5 long, with tapering width and maximum width was 2.1 cm) was retrieved from the wound track. Thickness of frontal bone was 6 mm.

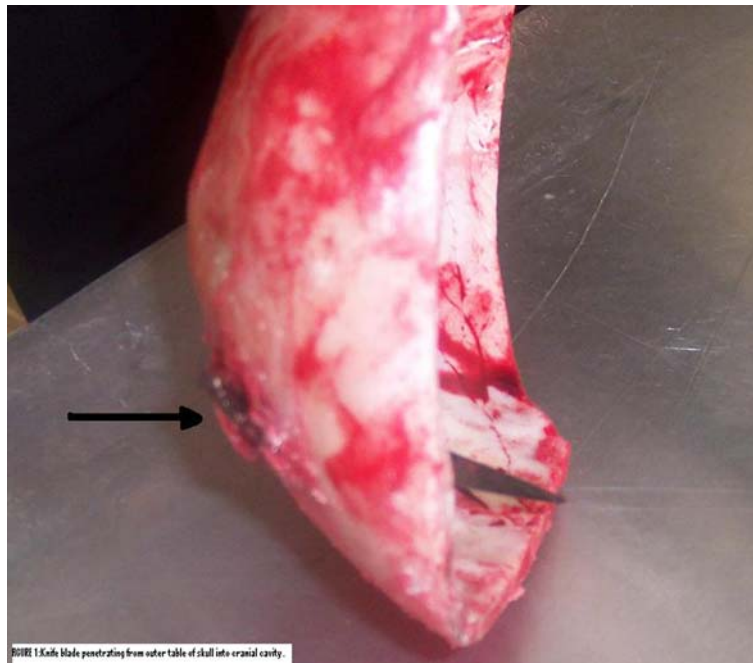


Fig. 1. Knife blade penetrating from outer table of skull into cranial cavity.

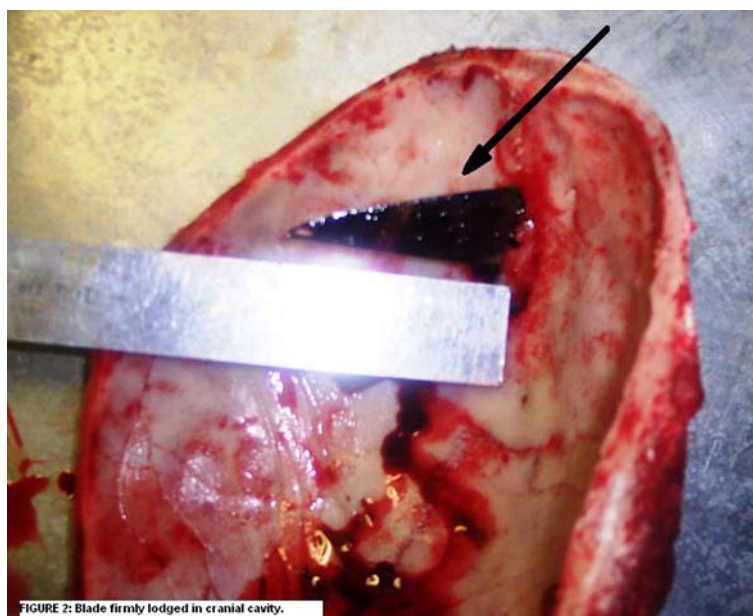


Fig. 2. Blade firmly lodged in cranial cavity.



FIGURE 3: Wound track in right frontal lobe of brain.

Fig. 3. Wound track in right frontal lobe of brain.

Lungs were oedematous. Other organs were intact and unremarkable.

Cause of death was determined to be incised penetrating wound of head by knife.

4. Discussion

Penetrating head injuries are encountered in both military and civilian practice. Penetrating head injuries are two types: missile injuries from bullet or shrapnel wounds and stab injuries which could be caused by knives, darts, pencils, machetes, etc. Stab wounds cause damage along the wound tract within the brain. If the wound involves an eloquent area of brain, a neurological deficit is likely to occur, whereas if non-eloquent areas are involved, no deficit may be discernible. Haworth and de Villiers have divided the structures in jeopardy into anterior and posterior zones. In the anterior zone lies the cavernous sinus together with oculomotor, trochlear, trigeminal, abducens nerve along with carotid artery, sella turcica and its contents. The brain stem and basilar artery lie within the posterior zone. In general, injuries that involve the posterior zone are usually fatal, whereas injuries involving the anterior zone may be survivable but often with high morbidity.³ Eloquent areas of brain refer to motor function areas of the brain and silent areas of brain are referred to as non-eloquent areas. Frontal lobe of brain is non-eloquent area of brain; hence deceased did not suffer immediately from the motor functions deficiency.

Knives and other sharp objects may enter the head, although wounds from these instruments are much less common than gunshot wounds. Stab wounds are much less disruptive to tissue than gunshot wounds because they are much lower in velocity.⁴

A stabbing instrument is likely to break when it passes through the sternum or skull or enters a vertebra.⁵

The neurological management of all penetrating head wounds derives from the same fundamental concepts, whether the penetration involves the scalp alone or the skull, dura and brain. The intent of treatment is to increase the incidence and quality of survival by preventing early and late infection, by controlling and relieving increased intra-cranial pressure, and by reducing secondary damage to the affected brain tissue.⁶ Davis et al.⁷ reported of a case where knife blade (1.7 cm long, 0.7 cm in width and 0.2 cm in thickness) was retained asymptotically in cranial cavity including brain for several months and never sought medical attention. In another case, Knife blade was retained in cranial cavity for 3 years without neurological deficit and 1 cm long blade tip was extracted from skull bone.⁸

The force necessary for skull penetration which has to be created by muscular work of the assailant because the mass of the weapon (knife) is negligibly small requires to be thrust onto a very small surface area. Any movement of the skull relative to the stab direction would probably prevent skull penetration and cause the knife to be deflected. However, fixation of head is not a *conditio sine qua non* if the impact force is high enough. In South Africa, head is frequently the only target for knife attacks in fights between young males.⁹

Mortality rate is higher in those having retained transcranial blade than those without. Increased mortality was a result of vascular injury as retained blade has potential for more cerebral and vascular injury. Vascular injury may present acutely with intracranial haemorrhage or may be delayed if a false aneurysm has developed. Vascular injury occurred in approximately 30% of patients and over all mortality rate was 17%. The higher incidence of vascular injury in patients presenting with retained blade related to the factor that retained blade tend to have suffered deep intracranial penetration. This allows for exposure of more

cerebral vessels to the blade and hence a greater chance of vascular injury. It is also possible that retained blade may prevent haemorrhage by tamponading an incised vessel. This may allow a patient with a severe vascular injury to seek medical care only to deteriorate when the blade is removed.¹⁰

No fatalities were reported from 16 cases of penetrating stab wound of head with retained intracranial blade and technique of safe removal of blade was followed. Van Dellen and Lipschitz suggested that the prognosis is worse for patients in whom the knife blade is removed by assailant. It was postulated that under these circumstances the blade is rocked and twisted more to remove.¹¹

Iwakura et al.¹² reports that a 28-year-old man attempted to kill himself with a knife stab into the parietal area of head. Knife blade was removed through a craniotomy without new brain injury. Post operative neurological findings showed no deficit and follow up angiography revealed no vascular impairment. Brain stab wounds cause numerous complications, such as intracranial haemorrhage, injury of important vessels, and infections.

Any scalp lesion, even if minor, may constitute important medico-legal evidence, and therefore careful inspection, exposure of wound is crucial including palpation of underlying skull bone. Wound track should never be probed in living. A proper protocol of management for head injuries needs to be drawn up and adhered to in all casualty or accident and emergency departments of hospitals to prevent fatalities and delayed complications. A skull X-ray should be a routine investigation performed in all cases of head injury prior to discharge of a patient, irrespective of level of consciousness and especially in the inebriated patient.

In the present report, an effort is made to present a rare case in which blade of knife retained in cranial cavity for 5 days. The blade spared the sagittal sinus and it was firmly lodged through the duramatter and into the right frontal lobe of brain, so intra-cranial bleeding ensued slowly and took about 3–4 days to attain sufficient volume to cause signs of compression and death eventually took place after 5 days of infliction of stab wound.

5. Medico-legal problems arising from the case

Police are still investigating a charge of murder, and when the trial is held, the medical officer and author would be called to testify. A likely question that may arise is whether the deceased was victim of murder (with respect to an assailant) or negligent duty or care by the medical doctor at the hospital, in the light of the fact that the medical officer did not ask for a skull X-ray (to detect the frac-

ture and foreign body in the brain) and did not keep the patient under observation.

Furthermore, if casualty doctor had done proper examination including exposure/inspection of wound and frontal and anterior posterior view of skull by radio-graphic examination, he would have detected foreign object (blade) penetrating into the cranial cavity, then he would have referred the deceased to tertiary institution having neurosurgery department for further management. As the blade was lodged in the frontal lobe, it was quite possible that with limited craniotomy, blade could have been removed and deceased's life could have been saved.

6. Conclusions

This case highlights the problem of incomplete clinical examination of a head wound; also the relationship between trauma and its complications resulting in intracranial haemorrhage and carry inherent risk if treatment is limited to local measures only. This case highlights the need of radiographic assessment of frontal and lateral views of penetrating wounds of head.

Retained transcranial knife blades have a higher incidence of early and late vascular complications and mortality rates are higher in patients with retained blades.¹⁰

References

1. Polson CJ, Gee DJ, Knight B. Injuries of specific regions (head injuries) *Essentials of forensic medicine*. 4th ed. Oxford: Pergamon press; 1985. p. 148–61.
2. Bhootra BK. An unusual penetrating head wound by a yard broom and its medico-legal aspects. *J Forensic Sci* 1985;2:567–71.
3. Payne-James J, Busuttil A, Smock W. Head injury – fatal and non fatal *Forensic Medicine – clinical and pathological aspects*. 1st ed. London: Greenwich Medical Media Ltd; 2003. p. 328–9.
4. Case ESM. Cranio cerebral trauma. *Handbook of forensic pathology*. 2nd ed. Northfield, IL: CAP; 2003. p. 153.
5. Reddy KSN. Medicolegal aspects of wounds. *Essentials of forensic medicine*. 21st ed. Hyderabad: Medical Book Company; 2002. p. 248.
6. Wilkins RH, Rengachary SS. Penetrating wounds of head. 2nd ed. *Neurosurgery*, vol. II. New York: McGraw-Hill; 1996. p. 2813–20.
7. Davis NL, Kahana T, Hiss J. Souvenir knife – a retained transcranial knife blade. *Am J Forensic Med Pathol* 2004;25:259–61.
8. Patel PM, Blackburn TP, Tait MJ, et al. Cranial blade retained for three years. *Br J Neurol* 2004;18:74–5.
9. Bauer M, Patzelt D. Intracranial stab injuries: case report and case study. *Forensic Sci Int* 2002;129:122–7.
10. Taylor AG, Peter JC. Patients with retained intracranial blades: a high risk group. *J Neurology* 1997;37(4):12.
11. Van Dellen JR, Lipschitz R. Stab wounds of skull. *Surg Neurol* 1978;10:110–4.
12. Iwakura M, Kawaguchi T, Hasoda K, et al. Knife blade penetrating stab wound to the brain- case report. *Neuro Med Chir (Tokyo)* 2005;45:172.